

that if the pixel electrode 849 and the drain region 827 are formed so as not to be directly connected, as in Fig. 18, then alkaline metals of the EL layer can be prevented from entering the active layer via the pixel electrode.

A third interlayer insulating film 850 is formed on the pixel electrode 849 from a silicon oxide film, a silicon oxynitride film, or an organic resin film, with a thickness of from 0.3 to 1  $\mu\text{m}$ . An open portion is formed in the third interlayer insulating film 850 over the pixel electrode 849 by etching, and the edge of the open portion is etched so as to become a tapered shape. The taper angle may be set from 10 to 60°, (preferably between 30 and 50°).

An EL layer 851 is formed on the third interlayer insulating film 850. A single layer structure or a lamination structure can be used for the EL layer 851, but the lamination structure has a better light emitting efficiency. In general, a hole injecting layer, a hole transporting layer, a light emitting layer, and an electron transporting layer are formed in order on the pixel electrode, but a structure having a hole transporting layer, a light emitting layer, and an electron transporting layer, or a structure having a hole injecting layer, a hole transporting layer, a light emitting layer, an electron transporting layer, and an electron injecting layer may also be used. Any known structure may be used by the present invention, and doping of such as a fluorescing pigment into the EL layer may also be performed.

The structure of Fig. 18 is an example of a case of forming three types of EL elements corresponding to R, G, and B. Note that although only one pixel is shown in Fig. 18, pixels having an identical structure are formed corresponding to red, green and blue colors, respectively, and that color display can thus be performed. It is possible to implement the present invention without concern as to the method of color display.

A cathode 852 of the EL element is formed on the EL layer 851 as a counter electrode. A material containing a low work coefficient material such as magnesium (Mg), lithium (Li), or calcium (Ca), is used as the cathode 852. Preferably, an electrode made from MgAg (a

material made from Mg and Ag at a mixture of Mg : Ag = 10 : 1) is used. In addition, a MgAgAl electrode, an LiAl electrode, and an LiFAl electrode can be given as other examples.

The lamination body comprising the EL layer 851 must be formed separately for each pixel, but the EL layer 851 is extremely weak with respect to moisture, and consequently a normal photolithography technique cannot be used. It is therefore preferable to use a physical mask material such as a metal mask, and to selectively form the layers by a gas phase method such as vacuum evaporation, sputtering, or plasma CVD.

The EL element 8206 is formed by the pixel electrode (anode) 849, the EL layer 851 and the cathode 852.

Note that it is also possible to use a method such as ink jet printing, screen printing or spin coating as the method of selectively forming the EL layer. However, the cathode cannot be formed in succession with these methods at present, and therefore it is preferable to use the other methods stated above.

Further, reference numeral 853 denotes a protecting electrode, which protects the EL layer and the cathode 852 from external moisture and the like at the same time is an electrode for connecting to the cathode 852 of each pixel. It is preferable to use a low resistance material containing aluminum (Al), copper (Cu), or silver (Ag) as the protecting electrode 853. The protecting electrode 853 can also be expected to have a heat radiating effect which relieves the amount of heat generated by the EL layer.

Reference numeral 854 denotes a second passivation film, which may be formed with a film thickness of 10 nm to 1  $\mu$ m (preferably between 200 and 500 nm). The aim of forming the second passivation film 854 is mainly for protecting the EL layer 851 from moisture, but it is also effective to give the second passivation film 854 a heat radiating effect. Note that the EL layer is weak with respect to heat, as stated above, and therefore it is preferable to

perform film formation at as low a temperature as possible (preferably within a temperature range from room temperature to 120°C). Plasma CVD, sputtering, vacuum evaporation, ion plating, and solution coating (spin coating) can therefore be considered as preferable film formation methods.

Note that it goes without saying that all of the TFTs shown in Fig. 18 may have a polysilicon film as their active layer in the present invention.

When the pinhole is formed in the EL layer 860 in the light emitting device, the defective portion that the pixel electrode 849 and the cathode 852 are connecting through the pinhole is formed. By the repair method of the present invention, resistance can be higher by changing the defective portion to the denatured portion 860. Therefore, the brightness in the portion other than the pinhole of the pixel are raised, and the deterioration of the EL layer surrounding of the pinhole can be prevented the promotion.

Note that it is possible to implement Embodiment 11 combination with Embodiments 1 to 4, 6 and 8.

#### [Embodiment 12]

A light emitting device using an EL element is self-luminous and therefore is superior in visibility in bright surroundings compared to liquid crystal display devices and has wider viewing angle. Accordingly, it can be used for display units of various electric equipment.

Given as examples of electric equipment employing a light emitting device to which a repairing method of the present invention is applied are: a video camera; a digital camera; a goggle type display (head mounted display); a navigation system; an audio reproducing device (car audio, an audio component, and the like); a notebook computer; a game machine; a portable information terminal (a mobile computer, a cellular phone,